

CLAIMS

1. A process of production of a high strength galvanized steel sheet comprising continuously hot-dip galvanizing a high strength steel sheet having a content of Si of 0.4 to 2.0 wt% during which making the atmosphere of the reducing zone an atmosphere containing  $H_2$  to 1 to 60 wt% and comprised of the balance of  $N_2$ ,  $H_2O$ ,  $O_2$ ,  $CO_2$ ,  $CO$ , and unavoidable impurities, controlling, in the atmosphere, the  $\log(PCO_2/PH_2)$  of the carbon dioxide partial pressure and hydrogen partial pressure to  $\log(PCO_2/PH_2) \leq -0.5$ , the  $\log(PCO_2/PH_2)$  of the water partial pressure and hydrogen partial pressure to  $\log(PH_2O/PH_2) \leq -0.5$ , and the  $\log(P_T/PH_2)$  of the total partial pressure  $P_T$  of the carbon dioxide partial pressure  $PCO_2$  and water partial pressure  $PH_2O$  and the hydrogen partial pressure to  $-3 \leq \log(P_T/PH_2) \leq -0.5$ , performing the annealing in the reducing zone in a ferrite-austenite two-phase temperature region at  $720^\circ C$  to  $880^\circ C$ , then cooling by a plating bath and performing the molten zinc plating so as to form a hot-dip galvanizing layer on the surface of the cold rolled steel sheet, then heating for alloying the steel sheet on which the hot-dip galvanizing layer is formed at  $460$  to  $550^\circ C$ , it is possible to produce a high strength galvanized steel sheet.

2. A process of production of a high strength galvanized steel sheet as set forth in claim 1, characterized by performing the hot-dip galvanizing in a hot-dip galvanizing bath of a composition comprised of an effective Al concentration in the bath of at least 0.07 wt% and the balance of Zn and unavoidable impurities and performing the alloying at a temperature ( $^\circ C$ ) satisfying

$$450 \leq T \leq 410 \times \exp(2 \times [Al\%])$$

where,  $[Al\%]$ : effective Al concentration (wt%) in the hot-dip galvanizing bath

3. A process of production of a high strength

galvannealed steel sheet as set forth in claim 1 or 2 superior in bondability, characterized by being performed at an effective Al concentration (wt%) in the bath satisfying the effective Al concentration in the bath of:

5                    $[Al\%] \leq 0.092 - 0.001 \times [Si\%]^2$

                  where, [Si%]: Si content in steel sheet (wt%)

                  4. A manufacturing equipment of hot-dip galvanized steel sheet comprising providing a hot-dip galvanizing bath and continuously plating a steel sheet by molten  
10 zinc, said system for production of a hot-dip galvanized steel sheet for working the process of production of a high strength galvannealed steel sheet described in claim 1 characterized by making the annealing furnace an all radiant tube type annealing furnace and providing an  
15 apparatus for introducing into the annealing furnace a gas containing CO<sub>2</sub> in an amount of 1 to 100 wt% and comprised of the balance of N<sub>2</sub>, H<sub>2</sub>O, O<sub>2</sub>, CO, and unavoidable impurities.

                  5. A system for production of a hot-dip galvanized steel sheet comprising providing a hot-dip galvanizing bath and continuously plating a steel sheet by molten  
20 zinc, said system for production of a hot-dip galvanized steel sheet for working the process of production of a high strength galvannealed steel sheet described in claim 1 characterized by making the annealing furnace an all  
25 radiant tube type annealing furnace and providing an apparatus for burning CO or a hydrocarbon in the annealing furnace and producing a gas containing CO<sub>2</sub> in an amount of 1 to 100 wt% and comprised of the balance of  
30 N<sub>2</sub>, H<sub>2</sub>O, O<sub>2</sub>, CO, and unavoidable impurities.